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ABSTRACT

Presented is an evaluation of the effect of the three most commonly used question classification systems on preservice teachers' ability to classify questions and on their attitude toward questioning. Thirty elementary science teachers were randomly assigned to one of three treatment levels. Each treatment level consisted of self-instructional modules in which the Aschner, Bloom, or Sanders category systems were presented. Standardized gain scores were compared for each treatment, and results indicated that the Aschner-based question classification system had some advantages over the other two systems in terms of improving ability to recognize and classify questions based on cognitive levels and a more positive attitude toward using the classification system. (CS)

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THE EFFECT OF STUDYING DIFFERENT QUESTION CLASSIFICATION SYSTEMS ON PRESERVICE TEACHERS' ABILITY TO CLASSIFY QUESTIONS AND ATTITUDES TOWARD QUESTIONING

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The Effect of Studying Different Question Classification Systems on Preservice Teachers' Ability to Classify Questions and Attitudes Toward Questioning

Research on improving teachers' questioning level through the study of categorization systems has had generally favorable results (Rogers and Davis, 1971, Farley and Clegg, 1969, and Konetski, 1970). These studies made use of a variety of classification systems. Godbold (1973) reports that a substantial portion of the investigations of teacher questioning have employed the Bloom (1956), Aschner (1961) or Sanders (1966) category systems directly or have used instruments derived from them. Although Gall (1970) provides a descriptive analysis of these classification systems, no experimental studies have been conducted to evaluate the comparative efficacy of these programs in terms of student ability and attitude.

THE PROBLEM

The purpose of this study was to evaluate the effect of the three most commonly used question classification systems on preservice teachers ability to classify questions and on their attitude toward questioning.

PROCEDURES

Sample

The subjects consisted of thirty students at the University of Georgia who were nonsystematically enrolled in an elementary science methods course. These senior level preservice teachers were randomly assigned to one of three treatment levels.

Treatment Levels

The treatment levels provided training in classifying written questions into categories based on operationally defined hierarchies. All three treatments used self instructional modules and were run concurrently for one two hour session. In all cases, the modules consisted of a written description of the category followed by practice sessions requiring the students to identify the level of questions presented in a written list. Descriptions of the modules are presented below.

1. The Aschner Module. The ten students assigned to this group used a module based on Chapter Two of the Handbook of Effective Questioning Techniques (Blosser, 1973). This category system makes use of four classifications: (1) cognitive memory, (2) convergent, (3) divergent, and (4) evaluative.

2. The Bloom Module. The ten students assigned to this group used a module based on section 1 of Question Asking Skills for Teachers (Okey, Humphreys, Bedwell, 1973). Using Bloom's Taxonomy, this system provides six categories: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation.

3. The Sanders Module. The ten students assigned to this group used a module derived from Chapter Two of Questioning Strategies and Techniques (Hunkins, 1973). This system uses seven different categories: (1) memory, (2) translation, (3) interpretation, (4) application, (5) analysis, (6) synthesis, and (7) evaluation.

Design

Using Campbell and Stanley notation, the design for this study can be diagrammed as follows:

$$\begin{array}{cccccc} R & O_{1a} & X_1 & O_{2a} & O_3 & O_4 \\ R & O_{1b} & X_2 & O_{2b} & O_3 & O_4 \\ R & O_{1c} & X_3 & O_{2c} & O_3 & O_4 \end{array}$$

where X_1, X_2, and X_3 = the three treatment levels and,

$O_{1(a,b,c)}$ = pretests measuring ability to correctly categorize questions

$O_{2(a,b,c)}$ = posttests measuring ability to correctly categorize questions

O_3 = improved ability to correctly categorize questions (standardized gain score)

O_4 = an attitude toward questioning measure

The scoring of the three classifying pre- and post-tests differed due to the dissimilar categories in each questioning scheme. In order to compare the differences among treatment groups, the dependent variable was redefined as a standardized gain score. This procedure is described by Yeany (1977). Transformation of the gain scores to standard scores, in this case T scores, provides comparable scales for the three classifying tests. A standardized gain score was computed for each group and then analyzed using analysis of variance procedures.

INSTRUMENTATION

The following instruments were employed:

1. Science Question Classification Test (SQCT). Developed by the investigator to measure preserivce teachers' ability to recognize different cognitive levels of questions. The test has a published reliability of .82 (Riley, 1978).

2. Attitude Toward Questioning Measure. Developed by the investigator to measure the preservice teachers' attitudes toward questioning and the classification system used in the treatment.

RESULTS AND ANALYSES

T tests for dependent samples were used to determine differences between pre- and post-tests measuring ability to classify questions. Significant

differences were found between the pre- and post-tests on two of the three treatment groups.

TABLE 1

Means, Standard Deviations and t for the SQCT for the Three Treatment Levels

	Aschner		Bloom		Sanders	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Pretest	21.25	3.24	16.66	2.78	13.63	3.70
Posttest	29.62	2.97	18.66	6.86	17.13	3.56
t	-4.73		-0.88			-2.26
	p = .002		p = .40		p = .05	

Due to the scoring procedures, the T score results cannot be interpreted as a comparative measure across the three levels. As previously explained, standardized gain scores were computed for this purpose and analyzed using analysis of variance procedures. Table II provides the analysis of variance information on the dependent variable, SQCT Standardized Gain Score.

TABLE 2

Analysis of Variance for Standardized Gain Score

Source	D.F.	S.S.	Mean Squares	F	p
Between Groups	2	137.5298	68.7649	2.676	.09
Within Groups	22	565.4307	25.7014		
Total	24	702.9604			

Results of post hoc analysis using the Newman-Keuls Multiple Comparison Technique showed that the differences between the Aschner and the other two levels were significant at the .05 level. The standard gain score means of the three groups and results of the comparisons are presented in Figure 1.

Treatment Means

$\overline{X}_{Aschner} = 14.37$ $\overline{X}_{Bloom} = 9.22$ $\overline{X}_{Sanders} = 9.50$

Figure 1. A multiple comparison summary figure on the SQCT Gain Score.*

The final criterion measure sought to determine differences in students' attitudes toward the question classification system.

Results of analysis of variance for this measure are provided in Table III.

TABLE 3

Analysis of Variance for Attitude Toward Classification System

Source	D.F.	S.S.	Mean Squares	F
Between Groups	2	142.35	71.17	2.751
Within Groups	19	491.64	25.87	
Total	21	634.00		

p = .08

*Any two means not underlined by the same line differ significantly ($p<.05$).

The Newman-Keuls Multiple Comparison Procedure was used to determine differences between the group means. The group means and results of the post hoc analysis are provided in Figure 2.

Treatment Means		
$\bar{X}_{Aschner} = 24.05$	$\bar{X}_{Bloom} = 29.37$	$\bar{X}_{Sanders} = 29.63$

Figure 2. A multiple comparison summary figure on the Attitude Twoard Classification System.*

IMPLICATIONS

The increased emphasis on field based experiences in many teacher preparation programs has reduced the amount of student time spent in the college classroom. This time constraint forces decisions as to what competencies can be logically introduced and what procedures effectively and efficiently facilitate their acquisition.

Previously reported investigations have shown the efficacy of question classification training on raising the cognitive levels of teachers' questions in the classroom (Konetski, 1970, Riley, 1978, Rogers, 1969). The results of this study indicate that, given a short training period, the Aschner based question classification system has some advantages over the Bloom and Sanders systems. These advantages are improved ability to recognize and classify questions based on cognitive levels and a more positive attitude toward using the classification system.

If desired teaching competencies include higher levels of teacher

*Any two means not underlined by the same line differ significantly ($p<.05$)

questioning behavior then instruction in question classification hierarchies is recommended. If time for improving question classification skills is limited to one or two class sessions, then the Aschner model is recommended as the method of choice.

References

Aschner, M. J. Asking questions to trigger thinking. National Education Association Journal, 1961, 50, 44-46.

Bloom, B. S. (Ed) Taxonomy of educational objectives. Handbook 1, Cognitive Domain. New York: David McKarp Company, 1956.

Compbell, D. T. & Stanley, J. C. Experimental and quasi-experimental design for research. Chicago: Rand McNally and Company, 1971.

Farley, G. T. & Clegg, A. A. Increasing the cognitive level of classroom questions in social studies: an application of Bloom's taxonomy. Paper presented at the American Educational Research Association Symposium on "Research in Social Studies Education." February 1969, Los Angeles.

Gall, M. D. The use of questions in teaching. Review of Educational Research, 1970, 40, 707-721.

Godbold, J. V. Teacher training for effective questioning. Paper presented at the Annual Meeting of the National Council for Social Studies, 1973.

Konetski, L. C. Instructional Effect on Questions Asked by Pre-service Science Teachers. (Doctoral dissertation, Indiana University). 1970.

Okey, J. R., Humphreys, D. W. & Bedwell, L. C. Question asking skills for teachers. National Center for the Improvement of Educational Systems. Indiana University, 1973.

Riley, J. P. The effects of studying a question classification system on the cognitive level of preservice teachers' questions. Science Education (in press).

Rogers, W. M. & Davis, O. L. Varying the cognitive levels of classroom questions: an analysis of student teachers' questions and pupil achievement in elementary social studies. Paper presented at the meeting of the American Educational Research Association. Lexington, 1971.

Sanders, N. M. Classroom questions: what kind? New York: Harper and Row, 1966.

Yeany, R. H. Evaluating teacher preparation programs by assessing teachers and pupils. The CEDR Quarterly, 1977, 10(4), 11-14.